

Innovative Capabilities Pattern in SME Enterprises of Iranian Markazi Province

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Abstract

Success of organizations is mainly rooted in innovation. Nowadays innovation in the current theological place plays significant and crucial role for the organizations and most organizations seek for creation of new ideas so that utilize the knowledge for supplying new products and services for the customers and stakeholders, and accordingly they can develop necessary infrastructures for innovation. This research was conducted in order to identify factors and indexes affecting innovative capabilities in small and medium-sized enterprises with five main factors and 20 dimensions. These factors and dimensions included: Individual factor (knowledge, skill, personality characteristics, and motivation), team factor (combination, solidarity, relationship, size), organizational factor (culture, systems and processes, strategies, leadership and organization, learning), industrial factor (networking, suppliers, customers, and competition), national factor (governmental incentives, regulations, environmental conditions), and 86 indexes. Effectiveness level of these indexes on innovative capabilities was evaluated following designing the questionnaire and distributing it among 306 experts and staff of small and medium-sized enterprises of Markazi province, and research model was fitted using structural equations and IMOS software. Finally 80 indexes with 5 main factors and 20 dimensions were accepted for the archdesigned model. According to the research, successful innovative capabilities in small and medium-sized enterprises of Markazi province require attention to all above factors, dimensions, and indexes. Also results suggested that national factor gained first rank, industry factor gained second rank, organizational factor ranked as third, group factor ranked fourth, and individual factor ranked fifth. National dimension had the strongest relationship with innovative capabilities ($R^2 = 0.65$), and individual dimension had weakest relationship with innovative capabilities ($R^2 = 0.15$).

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Introduction:

Innovation is one of the main and most complicated issues faced by small and medium-sized enterprises. All agree on the importance of innovation in the growth, survival, and success of organizations and nations in the world. Application of innovation means that supplying current and future needs of consumers using existing industrial and competitive structure.

Changing customer needs and demands, quick technological change, increased competition in the market and increased economic prosperity have caused that small and medium-sized enterprises in different industries supply new products and innovation with growing speed, productivity, and quality. In fact, the customers seek for newer, more advanced, and more compatible products with their needs, and the companies inevitably should provide products which meet needs and expectations of their customers, because otherwise they will be defeated by the competitors. Therefore, the survival should be guaranteed with reliance on innovation and increasing innovative capabilities. Small and medium-sized enterprises are easier to match with the quick environmental changes and they react quicker to the economic and political factors. Small and medium-sized enterprises are agents for absorbing and employment of considerable part of populations and for training skilled labour force. In addition, supplying professional human resources for the large companies is accomplished by small and medium-sized enterprises. Today the academic and industrial communities have found that small and medium-sized enterprises can preserve their long-term superiority in competitive arenas with reliance on innovation and promoting innovation and innovative activities. To this end, considering importance of mentioned cases in small and medium-sized enterprises of Markazi province current research seeks for suitable solutions for solving existing challenges. Thus research question in this work is as follows: how is the pattern of innovative capabilities in small and medium-sized enterprises of Markazi province?

No research work has been conducted for offering pattern of innovative capabilities in small and medium-sized enterprises in Iran and specifically in small and medium-sized enterprises of Markazi province, thus this research may be innovative in this regards.

Review of Literature

Successful innovation is a key to business growth. In the realm of technological development, innovation processes have been transformed into various forms, like open innovation, crowd sourcing innovation, or collaborative innovation. Innovation, in general sense may be seen as a process of designing, developing and implementing a novel product or service to improve economic, physical and logical parameters in the process(Khamseh et al. , 2012). Innovation means introducing a new technology or integration of existing technologies in order to create

effective change in relation with the offered price or value to the customer or user (Hang, 2010). Innovation is development, application, absorption, and utilization of new value added in economic and social areas. Renovation and extension of products, services, and markets is development of new production methods and establishment of new management systems. So that it covers both the processes and outcomes (Crossan and Apaydin, 2010). successful implementation of innovation process need to identify targets of industry, technology resources, procedure of innovation and delivery, methods of transmission, factors affecting, absorbing and development method and each of them requires its own special expertisebased knowledge(Sharabiani et al.,2012). The current community is associated with movement and dynamics and axis of such dynamics is disappearance of the yesterday traditions and rules. Today most of techniques, concepts, approaches, and guidelines, which have been useful for effective organizational management and preparing them for the growth and success, are not much applicable. In fact it should be considered that the today world is world of innovation (Fadaee and Mosayebi, 2011). Some research works related to innovation have focused on types of innovation such as product/process, administrative/technical, and fundamental/gradual. Administrative innovation and technical innovation are other types of innovation. Technical innovation is in relation with the new products, processes, or services, while administrative innovation refers to the changes in social structure of organizations, such as absorption policies, resource allocation, task structure, authorities, and rewards (Roly, 2011). In economy and business area there are two types of classification of innovation including gradual innovation and radical innovation. Gradual innovation results from a continuous improving process. It means that innovation can deal with development and modification of existing knowledge and process. Fundamental (radical) innovation is a totally new and discrete phenomenon resulting from research and development activities in industrial, academic, laboratories or research works (Chiesa, 2001).

Innovations are classified into four main classes (Ardakani, 2012):

1. Developmental innovations: delivery of existing services to existing users with small changes and improvement in them.
2. Extension innovation: delivery of existing services to new users
3. Evolutionary innovations: Providing new services to existing users.
4. Total innovations: Providing new services to existing users.

Schmokler believes that distinction between “Product technology” and “production technology” Is very important for understanding the innovation. Knowledge about development or promotion of “production technology” and “product technology” is innovation in production and knowledge about production of products is innovation in production process. According to Adquist, innovation in production process can be classified into technological innovations in production

process, which is about new types of machineries, and organizational innovation in production process, which is related to new ways of organizing production processes (Keshavarz, 2010). According to Shompter another classification of innovation can be provided based on fundamental level of innovations compared to the existing facilities: Consecutive and ongoing improvements in a product or production process are known as marginal or consecutive innovations. According to Shompter, fundamental innovations or technological revolutions are more important. (Fagerberg, 2004) measuring innovation includes investigating situation and quality (turning an idea to a product or production process) of innovative activities at organizational and national level (OECD, 2005). This organization published Oslo instruction in order to measure innovation at company level. Subject method is used in this instruction for innovation measurement at company level out of case and subject methods. Following seven areas are examined for realization of this goal:

Information related to innovative activities such as R & D and non R & D innovation inputs (industrial design activities, marketing, etc.), innovation process goals, innovative activities' resources, innovative outputs. Innovation output information such as innovative products and processes, innovation obstacles, investigation of key technological effects such as IT on innovation process (Seyfi et al., 2013). There are also various reasons for innovation development main of which include as following (Bushehri et al., 2003): Innovation causes economic growth, it increases social welfare, leads to competitive superiority, reduces costs, increases income, compensates the past failures, helps to use opportunities, causes innovation, improves return on assets, and most importantly, it guarantees organizational survival.

In summary, innovation process includes four basic steps: Idea creation, research for turning idea to invention or discovery, development of research findings in the form of a product, and reaching the product to the market (Nazarizadeh, 2012). Innovation models are classified into static and dynamic models. In static models, the ability and knowledge of organization in a specific time period and specific point is utilized. While dynamic models consider technology as a current with both gradual changes and mutational changes (Afuah, 1998). Innovation imitation is usually easier in service sector. Thus competitive advantages resulting from this innovation is not much sustainable. Therefore, tendency to specialization of services will be high, because customers can be retained somehow merely with such customized experiences (Vandermeuw, 2004). Results of recent case-studies indicate that organizations often use customer contact approach and customer movement path for experience design. Innovation occurs in five areas: Physical Environment, Service Providers, Service Delivery Process, Customers and Support Services (Voss et al., 2007; Voss and Zomerdijs, 2007).

Potential capacity of an enterprise for doing innovative activities is known as innovative capacity (Arasti et al., 2008). There are two views for innovation evaluation at enterprise level: In the first view, enterprise's innovative achievements such as new products, academic and technological publications, patent registration and etc. are evaluated. In the second view, which is related to

evaluation of innovation capacity or potential of enterprise, its readiness for performing innovation is evaluated (Bushehri et al., 2003). At enterprise level, innovation success includes the organizational ability for developing a sustainable flow of real incomes resulting from endeavors for innovation (Nazarizadeh, 2012). Ultimate success in innovation means influencing the market (Serinivasan and Narayana, 2002). Diong showed that success in innovation has various dimensions. Dimensions such as human resources, strategy, culture, and structure, access to tools, network and enterprise features. In 2012 Nili proposed a model for understanding components of innovation capacity which contained 4 major elements of culture, resources, competencies, and networking (Tohidi et al., 2015).

Types of innovative capabilities levels include as follows: Individuals and groups, innovative product or process, project, the whole company (Boly and Morel, 2003).

Methodology

Since results of this research address description of current status, thus it is a descriptive research. Considering direct relationship of researcher with the phenomenon under study, it is a field study and since it aims at identifying factors affecting innovative capabilities in small and medium-sized enterprises, it is an applied research. Data were collected using questionnaire and interview with staffs. Reliability of questionnaire was investigated using cronbach's alpha. Validity of questionnaire was confirmed by expert idea. With review of literature and summarization of related research works and expert ideas, 143 indexes affecting innovative capabilities in small and medium-sized enterprises of Markazi province were identified using designing questionnaire which measured effectiveness of these indexes. Experts also discussed about the indexes, and 86 indexes were accepted following screening and they were classified in the form of 5 factors and 20 dimensions. Main identified factors included: General dimension which is composed of economic, organizational, regulatory, and supervisory factors, and specific dimensions which is composed of technological and technical, marketing, and systemic factors, and final questionnaire was designed accordingly, and it was distributed among 306 experts and staffs of small and medium-sized enterprises of Markazi provinces. Research model was fitted using structural equations and AMOS software.

Research Findings

In order to answer the research question, 86 main filtered indexes were obtained, which were finally analyzed using AMOS software for validating research model. That is, first the factors and respective dimensions were fitted and investigated individually, and indexes with factor load below 0.5 were eliminated from the model (Kline, 2011). Then, dimensions were reduced using AMOS and impute method, and thus the total model was fitted. Figure 1 indicates total model in standard coefficients estimate state and Figure 2 demonstrates total model (confirmed model) in non-standard coefficients estimate (significance) state.

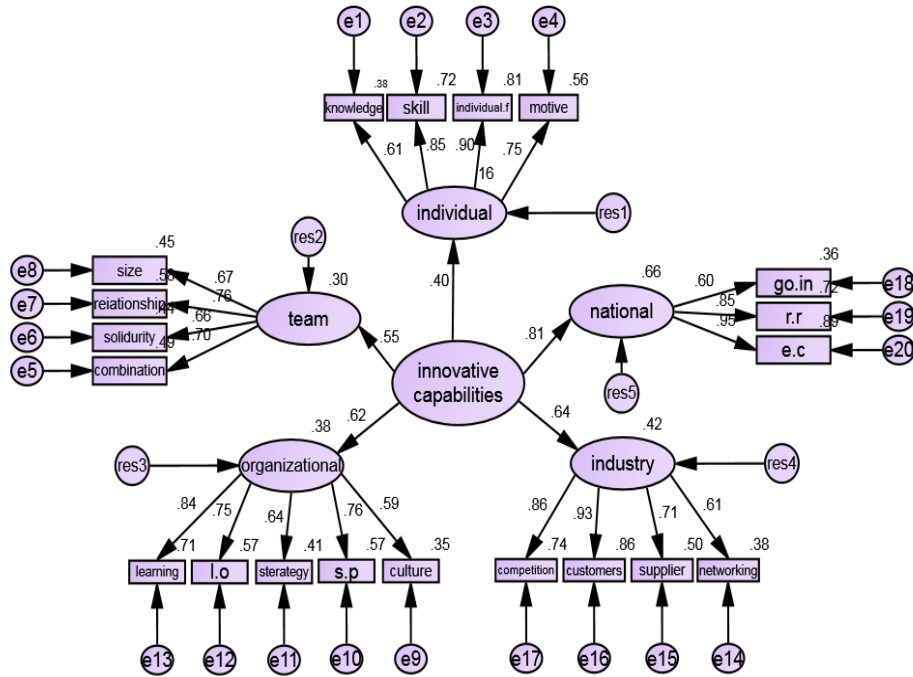


Figure 1: Total research model with factor load coefficients

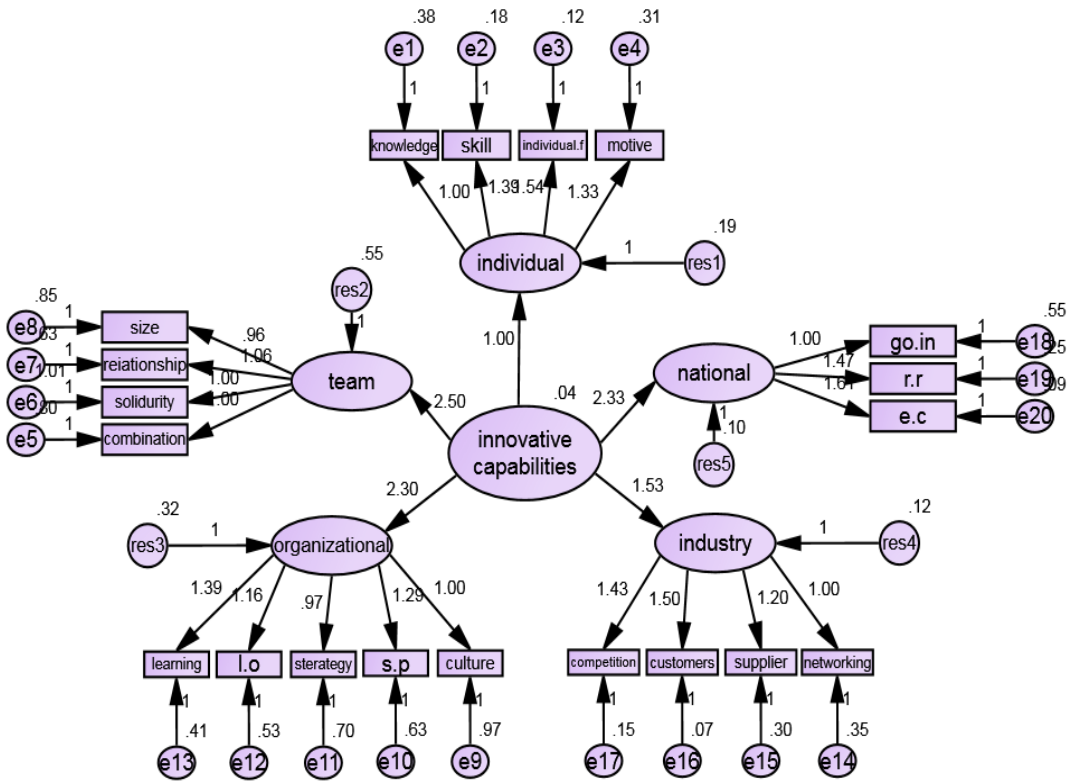


Figure 2: Total research model after fitting with significance coefficients

Results of structural model fit according to fit indexes according to Figures 1 and 2 and Table 1 in accepted criteria intervals are confirmed.

Table 1: Status of model fit indexes

Fit indexes	Allowed value	Obtained value
X2/df	<3	2.171
RMSEA	<0.08	.063
PNFI	>0.05	.769
GFI	>0.8	.894
AGFI	>0.8	.866
NFI	>0.9	.885
TLI	>0.9	.924
RFI	>0.9	.868
CFI	>0.9	.934
IFI	>0.9	.935

Considering Table 1, and values extracted from AMOS software output it is observed that the main research model has very good fit given absolute indexes and comparative indexes, and this model can be generalized to a larger population in reality. All obtained values suggest relationship between variables and dimensions and between dimensions and innovative capabilities.

Table 2. Supporting relationships and significance for innovative capabilities

Relationships	Non-standard estimate	tvalue	sig
Individual ← innovative_capabilities	1.000		***
Team ← innovative_capabilities	2.504	4.381	***
Organizational ← innovative_capabilities	2.303	4.464	***
Industry ← innovative_capabilities	1.534	4.591	***
National ← innovative_capabilities	2.330	4.668	***

As observed in Table 2, significance of relationships between factors is reported in software outputs. Relationship between factors and innovative capabilities are significant at level 99 percent.

Considering indexes extracted from review of literature, and according ideas of experts in small and medium-sized enterprises of Markazi province and following supporting model fit according to Figure 1 and Table 1, innovative capabilities pattern in small and medium-sized enterprises of Markazi province is as Figure 3.

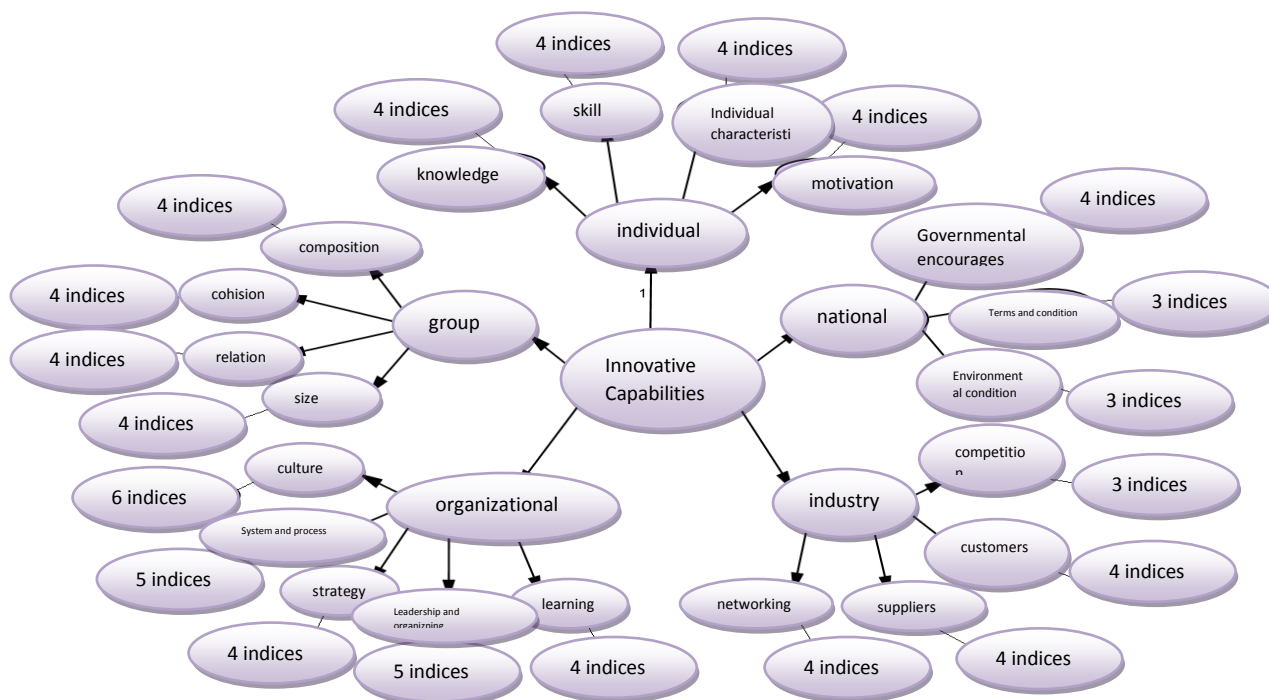


Figure 3 Innovative Capabilities Pattern in Small and Medium-Sized Enterprises of Markazi Province

Discussion and Conclusion

Nowadays innovation in the current theological place plays significant and crucial role for the organizations and most organizations seek for creation of new ideas so that utilize the knowledge for supplying new products and services for the customers and stakeholders, and accordingly they can develop necessary infrastructures for innovation. Increasing significance of innovation is due to globalization of markets and competition pressure on the companies so that they constantly seek for innovation. In this research, 5 factors, 20 dimensions and 80 final indexes were obtained. Research findings showed that all dimensions and factors have significant impact on innovative capabilities in small and medium-sized enterprises of Markazi province. Among the five factors, national factor has highest significance on innovative capability. In addition, based on AMOS software outputs, the indexes with highest r^2 have larger share in describing variance and strengthening and predicting behavior of respective factors, thus they require more attention.

Considering results of Table 3 and Figure 1, following results and recommendations are obtained:

Recommendations based on indexes of each dimension:

Considering results obtained from software report it is observed that “education level” index has highest significance ($r^2 = 0.816$) on knowledge variable in small and medium-sized enterprises of Markazi province. Thus, it is suggested that the managers use labor forces with academic education when recruiting employees, and attempt to enhance educational level of existing employees. Also “knowledge and working experience” index have highest significance ($R^2 = 0.870$) on skill variable in small and medium-sized enterprises of Markazi province. Thus it is suggested that operational managers of the companies use the tests in recruitment so that individuals with appropriate knowledge and experience can be selected for working in the organization. Suitable courses and trainings should be used in the organizations for enhancing knowledge and working experience of individuals employed in the organization. On the other hand it is observed that index of “allocating time for new ideas” has highest significance ($R^2 = 0.580$) on individual (personality) features variable in small and medium-sized enterprises of Markazi province. To this end, it is suggested that small and medium-sized enterprises support people with new ideas for development of the organization and allocate more time on ideas of these people so that good productivity can be derived from these ideas and they can be operationalized. Index of “individual ability and endeavor for giving innovative ideas” has highest effect ($R^2 = 0.855$) on motivation variable in small and medium-sized enterprises of Markazi province. To this end, it is suggested that motivational means and incentives are used in small and medium-sized enterprises to increase individuals’ ability for innovative ideas and individual attempts so that people automatically think of achievement of more knowledge and organizational goals in their working areas and beyond and increase their attempt even for competition with colleagues in order to provide the best ideas in innovation and offer more and better ideas. Index of “age composition” has highest effect ($R^2 = 0.785$) on combination variable in small and medium-sized enterprises of Markazi province. That is, just young people with higher education and low working experience should not be used in these enterprises. Thus, it is suggested that these enterprises use individuals with more working experience so that all employees can use each other’s experiences and utilize these experiences for raising knowledge and technical level of the organization and help it to achieve its goals properly.

Given obtained results, “team culture” index has highest effect ($R^2 = 0.673$) on solidarity variable. In order to enhance this index it is suggested that the managers conduct necessary educations for developing team culture and intimate relationships among individuals for raising culture of team work. In relation with relationship variable, index of “in-line individuals in the working group or team” has highest effect ($R^2 = 0.725$) on relationship variable in small and medium-sized enterprises of Markazi province. Hence, it is recommended these companies investigate working outcomes of individuals during a specific period of time for selecting working team members, and recruit those individuals which are in-line during their work period, even in terms of personality traits when forming the teams. Also it is observed that index of “small sized- group” has highest effect ($R^2 = 0.724$) on size variable in small and medium-sized enterprises of Markazi province. That is, the smaller is size of groups in small and medium-sized enterprises, more innovations are probable. Therefore, it is suggested that managers consider

formation of groups in small sizes with small numbers of members for advancing the organizational goals, thus leadership and management of the groups would be easier. In culture variable it is observed that index of “process view at innovation” has highest effect ($R^2 = 0.725$) on culture variable in small and medium-sized enterprises of Markazi province. Hence it is suggested that small and medium-sized enterprises establish innovation in the form of a four-step process including search, selection, implementation, and possession of value according to the model proposed by Tidd and Bessant (2009). On the other hand, index of “innovative ideas screening system” has highest effect ($R^2 = 0.894$) on variable of systems and processes in these companies. Hence, it is suggested that small and medium-sized enterprises obviously review innovative ideas proposed by individuals in the organization, and plan such a system in the organization so that they can distinguish and screen ideas, and select the best ones. As results showed it is observed that index of “innovation goals” has highest effect ($R^2 = 0.580$) on strategy variable in small and medium-sized enterprises of Markazi province. Therefore, it is proposed that managers of these companies consult about the strategy which is designed for the organization, and plan wider goals for innovation in the organization and pave the path for achievement of innovation so that the organization gain goals of innovation creation through the quickest and most appropriate way. In leadership and organization variable, index of “organizational structure type” has highest effect ($R^2 = 0.709$) on leadership variable in small and medium-sized enterprises of Markazi province. Thus, it is suggested that small and medium-sized enterprises regulate such a structure in which employee consultation is used for better leadership in the organization, so that the leader does not face problems in achievement of organizational goals. As results indicate, index of “learned lessons” of the accomplished projects has highest effect ($R^2 = 0.814$) on learning variable in small and medium-sized enterprises of Markazi province. In order to increase productivity of this index, it is suggested that the managers hold specialized educational courses for the employees so that individuals’ knowledge for better learning in line with innovative goals of the organization is utilized, and they should establish a system for recording and sharing learned lessons in the companies and industrial complexes. Index of “cooperation and interaction with academic centers” has highest effect ($R^2 = 0.723$) on networking variable in these companies. It is suggested that managers of small and medium-sized enterprises have the highest level of interaction with the academic centers for conducting research projects and organizational innovative projects. Thus it is better to construct networks which can have the highest information sharing at the shortest time for easier interaction and communication with these centers. Ideas and recommendations of the instructors and even the students, which are in interaction with the organizations, should be reviewed and used. Index of “(win-win) relationship with suppliers” has highest effect ($R^2 = 0.867$) on variable of suppliers in small and medium-sized enterprises of Markazi province. Hence, it is recommended that small and medium-sized enterprises change their view toward their suppliers as the business partner and participate them also in innovative ideas creation process. Index of “identifying customer needs and expectations” has highest effect ($R^2 = 0.662$) on variable of customers in small and medium-sized enterprises of Markazi province. Hence, in order to strengthen this index and

gain customer satisfaction and raise customers, it is suggested that small and medium-sized enterprises form and train a group for relationship with customers and record needs and expectations of customers during all steps so that the organization can take step for customer needs and expectations. Customer expectations may also provide group for new innovations in the organization. Index of “competition rules” has highest effect ($R^2 = 0.632$) on competition variable in small and medium-sized enterprises. It denotes that awareness of rules and regulation affecting competition in the industries in which small and medium-sized enterprises are active has significant impact on enhancing innovative capabilities. Therefore it is suggested that small and medium-sized enterprises move within competitive rules framework. Given the results it is observed that index of “customs and tax exemptions” has highest effect ($R^2 = 0.654$) on governmental incentives in small and medium-sized enterprises of Markazi province. Therefore, it can be concluded that governmental supports in the form of custom and tax exemptions play significant role in enhancing innovative capabilities in small and medium-sized enterprises due to their low financial power. Thus, it is suggested that this case is more considered in the future policies of the government. Also, the index of “national quality standards” has the highest impact ($R^2 = 0.492$) on variable of laws and regulations in small and medium-sized enterprises of Markazi province. This index indicates that if the national quality standards are developed and implemented in the small and medium-sized industries, innovative capabilities of these companies will be strengthened. Therefore, it is recommended that the National Organization of Standardization take effective measures in line with this index. Finally, it is observed that “economic conditions” index has the highest effect ($R^2 = 0.638$) on environmental conditions variable in the small and medium-sized enterprises of Markazi province. In other words, the economic situation in the country is more prosperous, increasing innovative capabilities in small and medium-sized enterprises is more probable. Therefore it is suggested that special support is provided for these companies in economic recession conditions.

Recommendations based on variables of each factor:

Considering results in Table 2, it is observed that in individual dimension, “motivation” variable is the most effective factor on individual dimension ($R^2 = 0.799$) in small and medium-sized enterprises of Markazi province. It means that motivation of individuals in the organization is the most important factor in achieving organizational goals and raising innovative capabilities by the organization members. Hence it is suggested that managers in small and medium-sized enterprises develop and implement a motivational system so that the organization members provide higher proficiency and attempt more for innovative capabilities and achievement of organizational goals. This motivational system is regarded as a strong motive for small and medium-sized enterprises. In team dimension, “relationship” variable is the most effective factor ($r^2 = 0.755$) on this dimension in small and medium-sized enterprises of Markazi province. In other words, the more is relationship between groups and teams in small and medium-sized enterprises, their innovative capabilities are increased. Therefore it is suggested that managers of

small and medium-sized enterprises regularly hold sessions for members of these teams so that limitations and problems are discussed and necessary decision are made. The networks can be designed for communication between team members so that they can share their needed information on an online basis which is in line with organizational goals. In organization dimension, “system and process” variable has the highest effect ($R^2 = 0.862$) in these companies. In order to enhance this effect, it is suggested that the systems and processes needed by innovative capabilities and the indexes appropriate for their evaluation are designed and evaluated regularly. In industry dimension, “competition” variable has highest effect ($R^2 = 0.868$) on this dimension in small and medium-sized enterprises of Markazi province. To this end, it is suggested that fair competition rules and mechanisms in the industry are designed and existing mechanisms and rules are reviewed in order to enhance innovative capabilities in small and medium-sized enterprises. In industry dimension, “competition” variable has highest effect ($R^2 = 0.717$) on this dimension in small and medium-sized enterprises of Markazi province. Since environmental conditions includes all economic, political, social, and cultural conditions, thus the government should develop rules, mechanisms, and groups at policy making level so that innovative activities are encouraged and motivated.

Recommendations based on the most effective factor:

Given results in Table 3, it is observed that among five selected factors, national factor is the most effective factor ($R^2 = 0.656$) on innovative capabilities of small and medium-sized enterprises of Markazi province. Since this dimension has highest share of effect, that is, rules and regulations, environmental conditions, and governmental incentives are the most effective dimensions in innovative capabilities of small and medium-sized enterprises, thus the government should take step for developing appropriate environmental conditions, facilitating rules and regulations, and special incentives for enhancement of innovative capabilities in small and medium-sized enterprises.

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